

WHAT IS CLAIMED IS:

1. An apparatus suitable for use in examining skin, mucosa and cervical tissues for the purpose of detecting cancer and precancerous conditions therein, said apparatus comprising:

(a) first illuminating means for illuminating an object with polarized light of a first wavelength;

(b) second illuminating means for illuminating an object with polarized light of a second wavelength, said second wavelength being different from said first wavelength;

(c) a control coupled to each of said first illuminating means and said second illuminating means to permit selective actuation of said first illuminating means and said second illuminating means;

(d) a light detector for outputting an electrical signal in response to light incident thereonto;

(e) an adjustable polarizer positioned between said light detector and the illuminated object;

(f) optics for imaging light emitted from the illuminated object onto said light detector;

(g) a computer for processing the output from said light detector;

(h) means for transmitting the output from said light detector to said computer; and

(i) a display for displaying the results of said processing by said computer.

2. The apparatus as claimed in claim 1 wherein said display is an LCD and wherein said apparatus further comprises a housing, said LCD, said transmitting means, said computer, said

optics, said adjustable polarizer, said light detector, said control, and said first and second illuminating means being mounted in said housing.

3. The apparatus as claimed in claim 1 further comprising a compact memory card removably mounted in said computer for storing image results.

4. The apparatus as claimed in claim 1 wherein said first and second wavelength are selected from the UV, visible and near-infrared portions of the spectrum.

5. The apparatus as claimed in claim 1 wherein said optics comprises confocal optics.

6. The apparatus as claimed in claim 1 wherein said optics are movably mounted to permit a variable lens to sample position distance.

7. The apparatus as claimed in claim 1 further comprising means for moving said optics relative to the sample to provide a variable lens to sample distance to image light from the surface or subsurface layers of the sample located at the focal imaging plane.

8. The apparatus as claimed in claim 7 wherein said moving means comprises a retractable housing in which said optics are mounted.

9. The apparatus as claimed in claim 7 wherein said moving means comprises a movable platform mounted inside of a housing, said optics being mounted on said movable platform.

10. The apparatus as claimed in claim 1 wherein said first illuminating means comprises a first light-emitting diode of a first color.

11. The apparatus as claimed in claim 10 wherein said second illuminating means comprises a second light-emitting diode of a second color, said second color being different from said first color.

12. The apparatus as claimed in claim 11 wherein said first light-emitting diode is a red light-emitting diode and wherein said second light-emitting diode is a blue light-emitting diode.

13. The apparatus as claimed in claim 11 wherein said first light-emitting diode is a red light-emitting diode and wherein said second light-emitting diode is a green light-emitting diode.

14. The apparatus as claimed in claim 11 wherein said first light-emitting diode is a blue light-emitting diode and wherein said second light-emitting diode is a green light-emitting diode.

15. The apparatus as claimed in claim 1 further comprising third illuminating means for illuminating an object with polarized light of a third wavelength, said third wavelength being different from said first wavelength and said second wavelength and wherein said control is further coupled to said third illuminating means to permit selective actuation of said first illuminating means, said second illuminating means and said third illuminating means.

16. The apparatus as claimed in claim 15 wherein said first illuminating means comprises a first light-emitting diode of a first color, said second illuminating means comprises a second light-emitting diode of a second color and said third illuminating means comprises a third light-emitting diode of a third color, said third color being different from said first and second colors.

17. The apparatus as claimed in claim 16 wherein said first light-emitting diode is a blue light-emitting diode, said second light-emitting diode is a red light-emitting diode and said third light-emitting diode is a green light-emitting diode.

18. The apparatus as claimed in claim 1 wherein said first illuminating means comprises a white light source and a first filter selective for light of a first color and wherein said second illuminating means comprises said white light source and a second filter selective for light of a second color, said second color being different from said first color.

19. The apparatus as claimed in claim 18 wherein said first filter is selective for blue light and said second filter is selective for red light.

20. The apparatus as claimed in claim 18 wherein said first filter is selective for blue light and said second filter is selective for green light.

21. The apparatus as claimed in claim 18 wherein said first filter is selective for red light and said second filter is selective for green light.

22. The apparatus as claimed in claim 15 wherein said first illuminating means comprises a white light source and a first filter selective for light of said first wavelength, wherein said second illuminating means comprises said white light source and a second filter selective for light of said second wavelength and wherein said third illuminating means comprises said white light source and a third filter selective for light of said third wavelength.

23. The apparatus as claimed in claim 22 wherein said first filter is selective for red light, said second filter is selective for green light and said third filter is selective for blue light.

24. The apparatus as claimed in claim 11 wherein said first illuminating means further comprises a polarizer and wherein said second illuminating means further comprises said polarizer.

25. The apparatus as claimed in claim 18 wherein said first illuminating means further comprises a polarizer and wherein said second illuminating means further comprises said polarizer.

26. The apparatus as claimed in claim 1 further comprising means for illuminating an object with polarized white light and wherein said control is further coupled to said white light illuminating means to permit selective actuation of said first illuminating means, said second illuminating means and said white light illuminating means.

27. The apparatus as claimed in claim 26 wherein said white light illuminating means comprises a white light-emitting diode.

28. The apparatus as claimed in claim 1 wherein said means for transmitting the output from said light detector to said computer comprises a cable, said cable being connected at one end to said light detector and at the other end to said computer.

29. The apparatus as claimed in claim 1 wherein said imaging optics comprises magnifying optics.

30. The apparatus as claimed in claim 29 wherein said optics comprises confocal optics.

31. The apparatus as claimed in claim 29 wherein said optics are movably mounted to permit a variable lens to sample position distance.

32. The apparatus as claimed in claim 29 further comprising means for moving said optics relative to the sample to provide a variable lens to sample distance to image light from the surface or subsurface layers of the sample located at the focal imaging plane.

33. The apparatus as claimed in claim 32 wherein said moving means comprises a retractable housing in which said optics are mounted.

34. The apparatus as claimed in claim 32 wherein said moving means comprises a movable platform mounted inside of a housing, said optics being mounted on said movable platform.

35. The apparatus as claimed in claim 1 wherein said adjustable polarizer is oriented to selectively transmit depolarized light emitted from the illuminated object.

36. An apparatus for use in examining an object, said apparatus comprising:

(a) a hand-held housing, said hand-held housing having an opening;

(b) first illuminating means, disposed inside said hand-held housing, for illuminating an object with light of a first color;

(c) second illuminating means, disposed inside said hand-held housing, for illuminating an object with light of a second color, said second color being different from said first color;

(d) a manually operable control switch coupled to each of said first illuminating means and said second illuminating means to permit selective actuation of said first illuminating means and said second illuminating means;

(e) an optical fiber disposed inside said hand-held housing and optically coupled at a first end to said first and second illuminating means and optically aligned at a second end with said opening;

(f) a first polarizer disposed inside said hand-held housing and optically aligned between said second end of said optical fiber and said opening of said hand-held housing;

(g) a light detector disposed inside said hand-held housing for outputting an electrical signal in response to light incident thereonto;

(h) a second polarizer disposed inside said hand-held housing, said second polarizer being positioned in front of and optically aligned with said light detector;

(i) optics for imaging onto said light detector light entering into said hand-held housing through said opening;

(j) a computer, disposed remotely relative to said hand-held housing, for processing the output from said light detector;

(k) a wireless receiver electrically coupled to said computer;

(l) a wireless transmitter electrically coupled to said light detector and mechanically coupled to said hand-held housing;

(m) a display coupled to said computer for displaying the results of said processing from said computer; and

(n) means for moving said optics relative to the sample to provide a variable lens to sample distance to image light from the surface or subsurface layers of the sample located at the focal imaging plane.